WORKING PAPER SERIES 14

Vlastimil Čadek, Helena Rottová, Branislav Saxa:
Hedging Behaviour of Czech Exporting Firms

2011

CNB CZECH NATIONAL BANK

WORKING PAPER SERIES

Hedging Behaviour of Czech Exporting Firms

Vlastimil Čadek
Helena Rottová
Branislav Saxa

14/2011

CNB WORKING PAPER SERIES

The Working Paper Series of the Czech National Bank (CNB) is intended to disseminate the results of the CNB's research projects as well as the other research activities of both the staff of the CNB and collaborating outside contributors, including invited speakers. The Series aims to present original research contributions relevant to central banks. It is refereed internationally. The referee process is managed by the CNB Research Department. The working papers are circulated to stimulate discussion. The views expressed are those of the authors and do not necessarily reflect the official views of the CNB.

Distributed by the Czech National Bank. Available at http://www.cnb.cz.

Reviewed by: Richard Friberg (Stockholm School of Economics)
Richard Fabling (Motu Economic and Public Policy Research)
Peter Tóth (Czech National Bank)

Project Coordinator: Michal Franta

Hedging Behaviour of Czech Exporting Firms

Vlastimil Čadek, Helena Rottová, Branislav Saxa*

Abstract

The hedging behaviour of Czech exporting firms is analysed using questionnaire information and interviews with banks. Approximately 60% of the 184 firms surveyed hedge their FX exposures, and about 88% of their exports are hedged. Most exporters use natural hedging, i.e. they balance incoming and outgoing payments in foreign currency as well as foreign currency assets and liabilities. Hedgers on financial markets prefer forwards and zero-cost option structures, as they are reluctant to pay option premiums. The typical maturity of financial instruments is three months to one year. More than one half of exporters hedge consistently, while around 60% hedge actively, taking advantage of currency moves. Our simple model of hedging behaviour for example suggests that trading within a group reduces the need for hedging.

JEL Codes: F14, F23, F31, G32.
Keywords: Exchange rate exposure, exchange rate risk, exports, hedging behaviour.

* Vlastimil Čadek, Czech National Bank, Interventions Division (e-mail: vlastimil.cadek@cnb.cz);
Helena Rottová, Czech National Bank, Monetary Policy and Fiscal Analyses Division (e-mail: helena.rottova@cnb.cz);
Branislav Saxa, Czech National Bank, Monetary Policy and Fiscal Analyses Division (e-mail: branislav.saxa@cnb.cz).
This work was supported by Czech National Bank Research Project No. A3/2010.
The authors would like to thank all the exporters and bank representatives who participated in our research for their valuable input, as well as Martin Cincibuch, Kamil Galuščák, Petr Král, Tomáš Holub, Miroslav Kalous, Peter Tóth, Richard Fabling, Richard Friberg and interim seminar participants for suggestions and helpful comments. The views expressed in this paper are those of the authors and do not necessarily represent those of the Czech National Bank.

Nontechnical summary

Due to substantial exchange rate movements and gradual appreciation of the Czech koruna, local exporters often hedge against exchange rate risk. This paper is focused on the hedging behaviour of Czech exporting firms. New information on hedging was gathered from two sources – a questionnaire for firms and interviews with banks. The results from these two sources provide a unique knowledge of what types of exporters hedge their foreign exchange exposures and how, what the intensity of foreign exchange hedging is in relation to export volume, and how successful these hedging activities are. On top of that, changes in firms' hedging behaviour in response to the financial crisis are analysed.

The initial sample contained 2,330 firms exporting at least 50% of their total earnings or having exports of at least one billion Czech koruna (CZK). Finally, out of the 2,330 questionnaires sent to firms we received 184 answers, which were further surveyed.

The sample results show that the majority of exports (more than 90%) head to Europe and 75% of exports are paid for in EUR. The share of local currency is small at around 5%. Approximately 60% of the firms surveyed hedge their FX exposures, and about 88% of their exports are hedged. Most exporters use natural hedging, i.e. they balance incoming and outgoing payments in foreign currency as well as foreign currency assets and liabilities. Hedgers on financial markets prefer forwards and zero-cost option structures, as they are reluctant to pay option premiums. More than one half of exporters hedge consistently, while around 60% hedge actively, taking advantage of currency moves.

Our simple model of hedging behaviour suggests that firm size and export-to-sales ratio increase the probability of hedging on financial markets, while trading within a group, being owned by a foreign owner or being hedged naturally reduces the need for financial hedging.

The sample of 184 exporting firms represents roughly 12% of local exports. However, caution is needed when interpreting the results. The sample includes only firms with a more than 50% share of exports in total sales or firms with nominal exports higher than CZK 1 billion. As the incentive to hedge decreases with firm size and export intensity ratio, the nationwide proportion of hedged exports is likely to be smaller than the one in our sample.

1. Introduction

This paper analyses the hedging behaviour of exporting firms in the Czech Republic. From the central bank's point of view, information about the responsiveness of firms' production, exports and profits to exchange rate changes is essential for monetary policy decisions. To some extent, a knowledge of the determinants and results of firms' hedging decisions is also relevant to the financial stability area and to banking supervision. Finally, potentially lower production due to exchange rate volatility is one of the topics in the discussion about euro adoption.

Our study sets out primarily to analyse and ascertain what types of exporters hedge their foreign exchange exposures and how, what the intensity of foreign exchange hedging is in relation to export volume, and how successful these firms' activities are, i.e. what the final impact of hedging is on firms' profits. Within this framework we distinguish a wide range of hedging methods and identify the distribution of the time horizons used for hedging. Furthermore, we analyse firms' hedging behaviour in the period 2005–2009 in the markedly changing economic environment due to the financial crisis. Finally, the survey results are utilized in a simple model describing the hedging behaviour of Czech exporting firms.

Since the key information necessary for this research is not a part of the official statistics, the data were collected through our own survey. The survey was conducted using questionnaires distributed to a selected set of exporting firms. In addition, local bank representatives were interviewed.

2. Recent Studies on Hedging Behaviour

Hedging of foreign exchange exposures draws the attention of both academic and policy-oriented research. The available empirical studies on foreign exchange hedging suggest that hedging of foreign exchange exposures is a significant part of risk management in many companies. To our knowledge, the hedging behaviour of Czech firms has not previously been studied to an extent comparable with this paper. In the following text we review some of the most recent studies on foreign exchange hedging based on either questionnaire-type data or data obtained from databases.

Empirical studies of hedging behaviour employing data from large databases are rare, mostly because of the very limited availability of firm-level foreign exchange hedging data. Fabling and Grimes (2008a, 2008b) take advantage of the information-rich New Zealand Customs database and study the hedging behaviour of New Zealand firms. The authors find strong evidence of both optimal and selective hedging. According to selective hedging theory, firms tend to lock their exchange rates when rates are perceived to be low. Optimal hedging theory assumes that firms' hedging decision is related to issues such as the risk of financial distress, the risk of underinvestment, scale factors, corporate governance and ownership. No evidence is found for the hypothesis that firms can anticipate currency movements, i.e. that firms hedge and a currency movement that would be unfavourable in the absence of hedging occurs in the future. Also, no evidence is found for the hypothesis that firms tend to make their hedging decisions based on the difference in short-term interest rates between New Zealand and

other countries. Finally, firms predominantly hedge their short-term exposures and remain exposed to medium-term volatility.

A large database is also employed by Bartram et al. (2006), who use data on more than 7,000 companies from 50 countries to study the determinants of using financial derivatives. The data come from the Thomson Analytics and Global Reports databases. While the sample size is an obvious advantage here, it comes at certain costs. The only information on the use of derivatives for each firm is binary – hedger versus non-hedger. Although a set of determinants of using derivatives to hedge was identified, using this kind of data cannot explain hedging behaviour more deeply.

The remaining related empirical studies are based on smaller samples, typically gathered through questionnaires.[1]

Focusing not on hedging directly but rather on the issue of currency denomination, Friberg and Wilander (2008) and Fendel et al. (2008) run surveys among exporters in Sweden and Germany respectively. Friberg and Wilander (2008) employ a questionnaire based on the answers of 256 Swedish companies to learn a number of insightful results. For most transactions, the price, invoice and settlement currency are the same. The currency of the customer is used mostly, but bargaining power also plays a role. Interestingly, no big difference is found between currency denominations in the cases of intra-firm and between-firm trade. As for size, small exporters are more likely to use the domestic currency for their exports. Finally, neither the expected path of the exchange rate nor the availability of financial instruments is important for the choice of currency. Using a sample of 90 companies, Fendel et al. (2008) show that the majority of German exporters (70%) price exports in the currency of customers. Exporters using the currency of customers add an additional mark-up to the price.

The studies most closely related to our paper are those using questionnaires to identify patterns of hedging behaviour in different countries (Davies et al., 2006; De Ceuster et al., 2000; Hagelin and Pramborg, 2004). Davies et al. (2006) use a sample of 81 Norwegian exporters. The authors emphasize two possible sources of foreign exchange hedging – external, using financial derivatives, and internal. Specifically, they recognize matching/netting, leading/lagging, pricing considerations, foreign borrowing, foreign bank accounts and balance sheet hedging as internal methods of hedging. Altogether, 70% of firms use some kind of hedging, with bigger companies being more intensive hedgers (79%) than smaller ones (57%). Among the most frequently used types of hedging are matching/netting (53%) and currency forwards (38%). When identifying the determinants of hedging decisions, the authors find firm size, the extent of internationalization and liquidity to be the most important drivers behind the decision to hedge against currency risk.

Focusing on the use of financial instruments to hedge against foreign exchange and other risks, De Ceuster et al. (2000) survey large Belgian non-financial firms. They base their results on a sample of 73 firms. Out of these, 66% use financial derivatives. Among the risks which are hedged by financial instruments, the most important is currency risk, followed by interest rate risk. Among the most important reasons for not using derivatives are i) restrictions imposed by the board of directors,

[1] Typically, questionnaire-based surveys have a relatively low number of surveyed companies, especially compared to database-based ones. The exception is the study of Bodnar et al. (2011) with 1,161 responses, although this comes at the cost of an extremely large initial sample (the response rate was 2%).

ii) risk related to using derivatives, iii) insignificance of exposure and iv) the existence of other hedging alternatives. Firms hedging currency risk (47 out of the 49 firms using derivatives) primarily hedge current contracts (70%) and transactions anticipated within one year (68%). About 20% of firms hedging currency risk also hedge anticipated transactions beyond one year. The most favoured derivatives in hedging currency risks are forwards, followed by swaps, over-the-counter options and structured contracts.

Hagelin and Pramborg (2004) evaluate data obtained using a relatively short questionnaire on the hedging behaviour of Swedish firms. Based on a sample of 101 to 130 companies, the authors find a significant reduction in foreign exchange exposure from the use of financial hedges, in the form of either foreign-denominated debt or currency derivatives.

For large companies, one might opt to find hedging information in firms' financial publications instead of collecting them via a questionnaire. Döhring (2008) uses data based on national sources (compiled and provided by the ECB) and information gathered from the financial publications of 33 large multinational non-financial firms included in the EuroStoxx50 index. He analyses hedging and invoicing strategies for reducing the exchange rate exposures of euro-area exporters. The paper finds that euro-area exporters have instruments at their disposal to limit the adverse impact of euro movements and that they use them. The euro is the dominant invoicing currency for euro-area exports to the rest of the EU countries and accounts for roughly half of euro-area exports outside of the EU; this approach thus noticeably shifts transaction risk to foreign importers. Data on 33 selected large firms revealed that a majority of them use a mix of forwards, options and swaps, but exchange rate forwards dominate. These firms also refer to natural hedging (they systematically match the currencies of revenues and expenditures as well as of assets and liabilities) and roughly half of them centralize hedging of the group's net foreign exchange exposure.

3. Foreign Trade and Exchange Rate Developments in 2005–2009

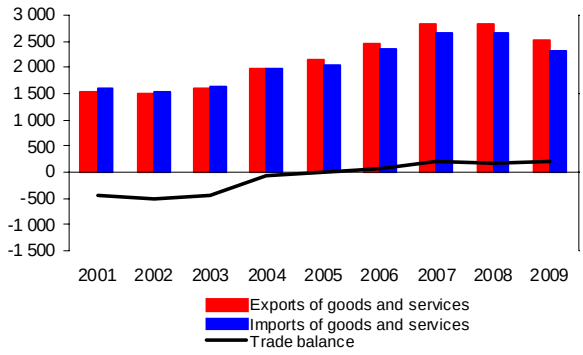
Given the high openness of the Czech economy, foreign trade is considered to be an important factor of GDP growth. In this context it is useful to point out the high import intensity of Czech exports and the close economic interconnection with EU countries. Exports are driven mainly by machinery and transport equipment, which comprises approximately 50% of overall exports.[2] As for the regional breakdown, about 85% of Czech exports head to the European Union (about 66% to the Eurozone).[3]

The *foreign trade* turnover of the Czech Republic rose markedly in the period under review, mainly in 2004 after it joined the European Union (see Figure 3-1). This trend was visible until the beginning of the global financial crisis, which sharply dampened the foreign trade activities of Czech firms (see Figure 3-2).

[2] Source: Czech Statistical Office (CZSO).

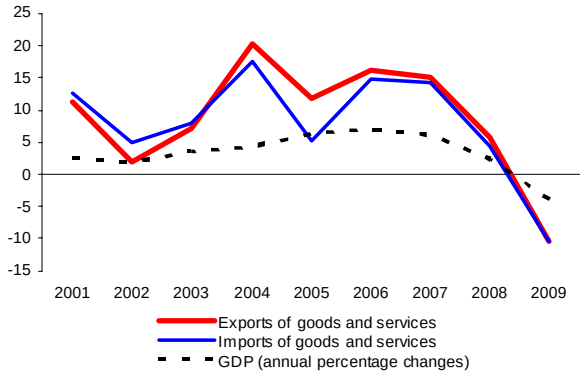
[3] Source: CZSO.

Figure 3-1: Foreign Trade (CZK bn, current prices 2000)



Source: CZSO

Figure 3-2: Export and Import Growth (annual percentage changes, constant prices)



Source: CZSO

The global economic slowdown in 2008 and downturn in 2009 significantly hit the dynamics of both exports and imports. Exports plummeted by 10.5% in year-on-year comparison in 2009;[4] since 2000 they had been recording annual average growth of 12% (see Figure 3-2). Although the koruna exchange rate weakened significantly at the end of 2008 and beginning of 2009 (see Figure 3-3 and Figure 3-4), this change could not support real export growth noticeably under the given circumstances. The generally accepted idea that a weakening of the domestic currency positively influences international competitiveness did not work in the crisis period because of the major external demand contraction.

Figure 3-3: Exchange Rate Developments (annual percentage changes)

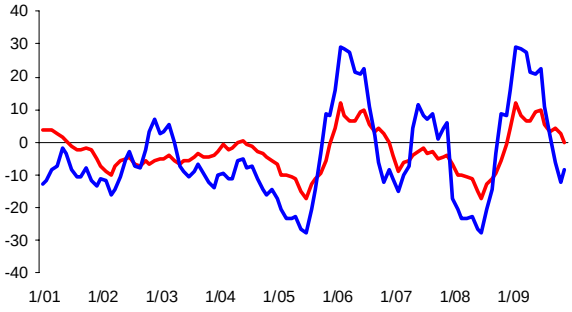
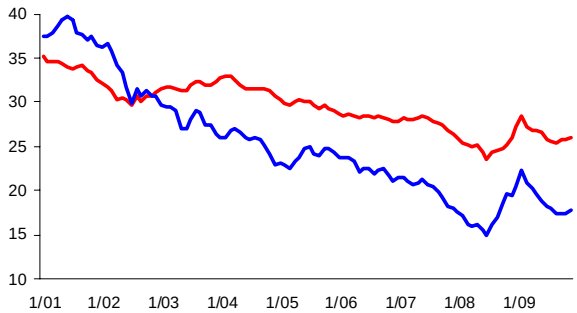


Figure 3-4: CZK/EUR and CZK/USD Exchange Rates (monthly values)



Nevertheless, the weaker domestic currency in general helped exporters to maintain profitability on exports in this period, although only for those exporters who had not hedged against a local

[4] Seasonally adjusted CZSO data.

currency appreciation or who had used suitable hedging strategies and instruments so that they could benefit from the marked currency weakening.

In this context it is worth mentioning that some firms do not make a distinction between hedging and speculation. Firms used higher leverage to improve the foreign exchange rate for their "hedging" operations, but this was in fact speculation on a continued firming of the domestic currency. Such firms thus became vulnerable to a local currency weakening, which materialized during the global crisis.

Central and Eastern European currencies weakened significantly at the end of 2008 and the beginning of 2009. This was a milestone for such speculators. Due to their high leverage, firms were forced to deliver more foreign currency than they could obtain from their exports. Consequently, they had to buy expensive foreign currency in the market and sell it to their banks for cheaper "hedged" foreign exchange rates. The losses from such operations and the plummeting global demand were a lethal combination which often led to bankruptcy.

On the other hand, some exporters were in a similar situation not because of the leverage in their financial instruments, but because they had hedged expected trades according to their financial plan. Due to the crisis, exports were lower, the plan was not fulfilled and these exporters also faced a shortage of foreign currency, which they were obliged to sell.

In the event of a significant default by exporters on their hedging operations, banks would be hurt badly. This poses a risk to financial stability. This is one of the reasons to watch the hedging behaviour of local exporters, as such information could give an early sign of potential danger for the local banking sector.

4. Research Methodology and Respondent Selection

As the available firm-level data do not include information on the hedging behaviour of Czech exporting firms, our research is based mainly on information obtained from *questionnaire*s. The statistics on foreign exchange derivatives are also of very limited use, mainly because of the high level of aggregation and the impossibility of distinguishing hedging transactions from speculative ones (carry trades etc.).

The questionnaire contained two types of questions (see the appendix for the full questionnaire). The introductory questions, relating to the basic characteristic of the company (e.g. sales, exports and imports volumes and export destinations), were limited. The majority of the questions were focused on specific aspects of firms' hedging behaviour. In particular, we were interested in the extent of firms' hedged exports, their practices in using specific hedging instruments and, last but not least, the impact of export hedging/non-hedging on economic results. We also wondered whether and how the recent financial crisis had changed exporters' hedging habits. The questionnaire included both quantitative and qualitative questions. The incentives for hedging or not hedging were not surveyed. Special attention was paid to formulating the questionnaire

questions clearly. Furthermore, in order to increase the likelihood of response, we only selected types of information of the greatest interest and thus kept the questionnaire relatively short.

The survey respondents were selected from the 2007 database of the Czech Statistical Office (the most recent one available). The database contains information on almost 41,500 firms, of which approximately 12,000 export their production abroad. A sample of 2,330 firms that export at least 50% of their total earnings or at least CZK 1 billion was selected. In the end, out of the 2,330 questionnaires sent to firms we received 184 consistent answers.

In addition to information collected via the questionnaire, we obtained more specific information about exporters' behaviour by conducting *interviews with local bank representatives* (e.g. information on whether leverage is used in hedging structures and information on the banks' approach to exposures in the exporters sector). In the end, this additional source of information was evaluated as very important, not least because banks have a relatively good knowledge of firms' hedging behaviour (such information is "amassed" there). Besides, it was useful to obtain information about banks' reaction to the recent crisis, notably whether they had changed their stance on customers' hedging operations. This extra information was also very helpful for *cross checking the information obtained from the questionnaire*.

Following sections summarize the main findings of the questionnaire and interviews. Most of the results relate to two time periods (2005–2008 and 2009), as we are also interested in possible changes in the respondents' hedging behaviour during the crisis.

5. Basic Information on the Survey Sample

The final survey sample contains information on 184 exporting firms, i.e. it is comparable in size to similar questionnaire studies.[5] Since not all of the firms answered all the questions, the number of firms analysed differs question by question.

In 2009, the respondents recorded total earnings of CZK 400 billion, i.e. approximately 7.4% less compared to the yearly average of the previous period (2005–2008).[6] At the same time, average exports declined by 3.3% to CZK 1.5 billion due to the global economic crisis. Table 5-1 shows the distribution of *firms' basic characteristics.*

[5] Friberg and Wilander (2008) work with 256 companies, Fendel et al. (2008) with 90 companies, Davies et al. (2006) with 81 companies, Hagelin and Pramborg (2004) with 101 to 130 companies in three samples and finally De Ceuster et al. (2000) with 73 companies

[6] On average the respondents recorded total earnings of CZK 2.3 billion in 2009.

Table 5-1: Sample Characteristics Distribution

	Number of Employees			
	sub–25	**25–49**	**50–149**	**150 or more**
Sample	17.7%	16.0%	22.7%	43.6%
2,330 firms	35.1%	16.3%	24.9%	23.6%
	Total Earnings (CZK mil.)			
	sub–50	**50–99**	**100–499**	**500 or more**
Sample	18.2%	11.4%	39.2%	31.3%
2,330 firms	36.2%	15.6%	29.9%	18.3%
	Exports (CZK mil.)			
	sub–50	**50–99**	**100–499**	**500 or more**
Sample	21.3%	14.9%	39.7%	24.1%
2,330 firms	40.7%	16.5%	27.9%	14.9%

The table gives an idea about the direction of the sample selection bias. It shows that the smallest firms are under-represented in our survey, even when compared to our initial sample of 2,330 companies. The share of mid-size companies corresponds to our initial sample and, consequently, the biggest firms are over-represented. While such selection bias has important consequences for the conclusions about individual firms, our final sample covers a relatively big proportion of aggregate exports from the Czech Republic. Regarding the *territorial distribution* the largest proportion of exports heads to Europe. In this respect, in our final sample exports to the Eurozone are over-represented and exports to the rest of Europe are under-represented, while the share of Europe as a whole reflects the aggregate share (slightly above 90%, see Table 5-2).

Table 5-2: Regional Distribution of Local Exports

Continent	**Share (survey)**	**Share (Czech Republic)**[7]
Eurozone	70.0%	58.4%
Rest of Europe	23.1%	33.3%
America	1.8%	2.6%
Africa	0.4%	1.0%
Asia, Australia	4.7%	4.6%
Not specified	0.0%	0.1%

The shares are calculated as averages weighted by the individual exports of the given companies. The territorial distribution of exports is apparently the key factor of the currency share distribution of payments in euro (see Table 5-3).

[7] Source: Czech Statistical Office data for 2009, [cit. 10-20-10], accessible from www: <http://apl.czso.cz/pll/stazo/STAZO.STAZO?jazyk=EN&prvni_pristup=>

Table 5-3: Currency Distribution

Currency	Share
EUR	75.3%
USD	6.2%
CZK	2.1%
GBP	3.4%
Others	13.0%

The low proportion of CZK-denominated exports is not surprising. It should not, however, be attributed only to the low bargaining power of local exporters. Although exporting in local currency mitigates short-term exposure to FX risk, the exporter is not completely independent of local currency movements. Continued appreciation of the local currency leads to a loss of international competitiveness because the exporter's production becomes increasingly expensive for its customers abroad. Therefore, even an exporter receiving CZK is exposed to FX risk, but in a different way than an exporter receiving foreign currency (the latter, unlike the former, is exposed to future cash flow volatility). Companies hedging their exchange rate risk could lose competitiveness in the long run as well, although the use of suitable hedging strategies can at least slow down the effect of local currency appreciation.

6. Hedging Strategy

This section summarizes the extent to which Czech exporters hedge their FX exposures, the instruments and maturities they use to hedge, and the perceived rate of success.

The results show that about one third of the companies surveyed do not hedge their FX exposures at all (Table 6-1). More specifically, in the period of 2005–2008, only 28.2% of exporters were *fully unhedged*; in 2009 that share rose to 30.4%. On the other hand, approximately 23.8% and 22.7% of respondents were *fully hedged* in the respective time periods. The number of fully unhedged respondents thus increased in 2009, while the number of those who were fully hedged decreased. Overall, just over 60% of exporters hedged their FX exposures either partially or fully. Besides firms with FX exposures, about 5.5% of firms receive payments for their exports in CZK only. Such firms do not use any hedging instruments as they do not have any FX exposure. The *weighted average rate of hedging*[8] in our sample was 88.1% in 2005–2008 and 87.5% in 2009. When limited to those who hedge against exchange rate risk, the weighted average rate of hedging was 93.4% and 94.5% in 2005–2008 and 2009 respectively.

[8] The average share of hedged exports in total exports, weighted by the exports of the individual companies.

Table 6-1: Approach to Hedging

	2005–2008	**2009**
Fully unhedged	28.2%	30.4%
Partially hedged	39.2%	37.6%
Fully hedged	23.8%	22.7%
100% paid in CZK	5.5%	5.5%
No response	3.3%	3.9%

Due to our focus on exporters with high exports-to-sales ratios and big exporters, our weighted average rate of hedging does not necessarily reflect the nationwide rate of hedging.[9] The lower is the share of exports in a company's sales, the lower is the volatility of its revenue due to FX risk and thus probably the lower is the incentive to hedge against FX risk.[10] The nationwide rate of hedging is therefore likely to be lower than our sample weighted average of 88%. Once we adjust the weights to reflect the firm size distribution in our initial sample of 2,330 companies (Table 5-1), the adjusted average rate of hedging decreases to 85%.

Regarding the choice of hedging methods, the survey revealed that the most popular hedging instruments are *natural hedging* and *outright forwards* (see Table 6-2).[11] Almost 60% of hedged exports are hedged using natural hedging, while the rest are covered mostly by financial derivatives. The use of other instruments is negligible. The results also suggest that there was no substantial change in the choice of hedging instruments between 2005–2008 and 2009.

Table 6-2: Breakdown by Instrument (averages in per cent of exports)

	simple avg.	weighted avg.	simple avg.	weighted avg.
	2005–2008	**2005–2008**	**2009**	**2009**
Natural hedging	34.0%	53.0%	34.1%	56.4%
Forward	25.1%	37.6%	26.7%	35.6%
Operational hedging	0.2%	0.0%	1.2%	0.1%
FX loan	2.7%	0.6%	3.1%	0.6%
FX swap	1.2%	0.2%	0.4%	0.1%
Option	3.0%	1.8%	3.3%	1.5%
Surcharge	3.9%	0.3%	3.2%	0.2%
Total average	**70.2%**	**93.4%**	**72.1%**	**94.5%**

[9] Self-selection bias might be an issue too – firms that do not hedge might be less interested in filling in the questionnaire compared to hedgers.

[10] The relationship between a firm's size and its exports/sales ratio on the one hand and its likelihood to hedge on the other hand is estimated in section 9.

[11] The weighted averages presented in this table are calculated only for companies that hedge at least part of their exports. The weights used are the export volumes of the individual companies in the given time period.

The *shares of maturities of derivatives* changed to only a limited extent during the crisis (see Table 6-3). The majority of exporters continued to set their typical derivatives maturity at 3 months to one year (53% and 57% of companies in 2005–2008 and 2009 respectively). Although the response rate to that question was by far the lowest of all the questions in the questionnaire (around 35%) this was mainly because the remaining exporters do not hedge at all or do not use derivatives.

Table 6-3: Relative Numbers of Companies Using Particular Maturities

	2005–2008	**2009**
up to 3 month (incl.)	30.0%	20.6%
3 months – 1 year (incl.)	52.9%	57.1%
above 1 year	17.1%	22.2%

The timing of hedging is another key aspect of exporters' hedging behaviour (see Table 6-4[12]). The responses showed that more than half of the firms *hedge consistently*.[13] In addition, around 60% of exporters use a kind of *active approach* and hedge either when the koruna is weak by historical comparison or when they expect the koruna to appreciate. The motivation for such behaviour is to take advantage of currency moves and fix the exchange rate at moments when it is viewed more favourably. Rather surprisingly, only 7% of firms hedge when the current CZK FX rate is strong by historical comparison. The motivation for their behaviour is different – when the local currency strengthens to a level seen by the firm as critical, the firm fixes the exchange rate at this level to prevent further loss. Finally, seasonal hedging is relatively infrequent among the firms surveyed.

Table 6-4: Ways of Hedging (relative number of exporters; multiple choice)

Consistently	53.1%
Seasonally	7.1%
If the current CZK FX rate is strong by historical comparison	7.1%
If the current CZK FX rate is weak by historical comparison	22.4%
If according to a forecast the koruna is expected to firm	38.8%
In a different way	4.1%

Table 6-5 reveals whether firms' strategies were seen as successful or not. In both periods under review, being hedged was seen as more advantageous than not being hedged. The difference in perceived success between "hedged" and "unhedged" respondents is much smaller in 2009, reflecting the fact that the CZK FX rate was much weaker by historical comparison during that

[12] Multiple choice was allowed for this question, therefore the sum in the table is not equal to 100%.

[13] These respondents use both natural hedging and forwards.

year.[14] The weakening of the koruna mainly decreased the value of longer-term hedging strategies (given that the most popular derivatives are FX forwards). Nevertheless, it is necessary to note that the weakening of the koruna was rather short lived.

Table 6-5: "Rates of Success"(relative number of exporters)[15]

	2005–2008	**2009**
due to hedging you had a better FX rate on average (including hedging costs)	30.4%	22.7%
due to hedging you had a worse FX rate on average (including hedging costs)	11.0%	17.1%
due to hedging you had around the same FX rate on average (incl. hedging costs)	9.4%	12.2%
due to not hedging against FX risk you had FX gains	7.7%	11.0%
due to not hedging against FX risk you had FX losses	18.8%	13.8%
due to not hedging against FX risk you had neither FX gains nor losses	7.7%	6.6%
no reply	14.9%	16.0%

We also attempt to assess whether active hedgers[16] were more successful than those hedging consistently. For this purpose we compare the answers to two questions from the questionnaire (this is in fact a partially aggregated cross-tabulation of Table 6-4 and Table 6-5; for the former we took into account only those who had chosen only one answer to the respective question).

During the period of koruna appreciation (2005–2008) active hedgers were more successful than those who were hedging consistently (see Table 6-6). On the contrary, in 2009 the active hedging strategy brought much worse results than in the previous period. This is to some extent the result of an unexpected and sharp weakening of the koruna in the first quarter of 2009.

Table 6-6: Results of Different Hedging Approaches (relative number of exporters)[17]

	2005–2008			**2009**		
	+	**-**	**0**	**+**	**-**	**0**
Hedging consistently	45%	33%	23%	38%	33%	28%
Active hedging	60%	20%	20%	40%	45%	15%

[14] The koruna depreciated to almost 30 EUR/CZK, a level last seen in October 2005.

[15] A hedged exporter is one with a hedging rate of at least 30% of its exports.

[16] Those who answered "If the current CZK FX rate is weak by historical comparison" and "If according to a forecast the koruna is expected to firm" in Table 6-4.

[17] A positive sign means a positive impact on the financial results, a negative sign means a negative impact and zero stands for neither a positive nor a negative impact.

As for the source of foreign exchange forecasts, most firms rely on banks' forecasts (67% of exporters, see Table 6-7). Home-made forecasts placed second with 46.1%, while roughly one third of respondents follow forecasts published in the media.

Table 6-7: FX Forecast Source (relative number of exporters; multiple choice)

Consensus Forecast	4.7%
Banks	67.2%
Home-made	46.1%
External advisor	5.5%
Media	34.4%
Others	15.6%

As exporters were generally quite successful in managing their FX risk, it is no great surprise that they do not plan to change their behaviour noticeably. This finding is apparent from Table 6-8, which shows the survey results in more detail.

Table 6-8: Exporters' Plans for the Future (relative number of exporters)

No change	76.2%
We will start/are starting to hedge committed trades only	3.3%
We will start/are starting to use different instruments	8.8%
We will reduce/are reducing hedging (as a % of exports)	3.9%
We will stop hedging totally	2.2%
No reply	5.5%

On the other hand, it is rather startling that 93% of exporters whose hedging or non-hedging had a negative impact on their economic results in both time periods stated that they were not planning any change of their hedging behaviour. Since their average export volume was CZK 481 million in 2009, many of them are probably not too small to hedge.

If we compare our results with exporters' hedging behaviour in other countries, we find that it is more or less similar. The majority of exports are hedged, although the intensity differs across countries. One factor that differs significantly is the share of exports in local currency. While our research shows a share of only around 5% in the Czech Republic, Fabling and Grimes (2008a) show a share of around 40% in New Zealand and Fendel et al. (2008) state that the share of exports in the currency of customers is 70% in Germany. However, the proportion of exports in local currency is determined to large extent by the structure of export destinations as well as the global importance of the local currency.

7. Findings of Interviews with Bank Representatives

Simultaneously with running the questionnaire survey we interviewed *bank representatives.* The idea was motivated by our expectation that banks are well informed about their clients and their operations and thus could provide us with valuable *information about some aspects of their clients' transactions* that would be difficult to collect via the questionnaire. Since we wanted to keep the questionnaire sent to exporting firms as simple as possible (in order to achieve a high response rate), we avoided in-depth questions (e.g. about financial derivatives) which might have resulted in a much lower response rate.

We interviewed *representatives of the five banks with the largest client derivative business in the local market*. These banks were chosen on the basis of the foreign exchange market turnover survey conducted by the Czech National Bank four times a year.

One observation is that the banks' answers and views are very homogenous. This facilitates comparison with the questionnaire findings as well as confirming that banks are well aware of their clients' transactions and that the information obtained from the interviews is relevant. In general, *banks are more risk averse after the crisis* and *clients*[18] *prefer simpler instruments and strategies*. Nowadays, banks assess clients more strictly and pay more attention to their operations and the ways they address their FX risk.

One of the interview findings is that, even after the crisis, banks are continuing to allow their clients to hedge not only their committed trades, but also their anticipated trades. However, something has changed: before the crisis the banks' approach was more relaxed, as they allowed their clients to hedge their FX exposures more aggressively. For example, it was not exceptional to see hedging for three or four years in advance. Nowadays, it is usually possible to hedge trades anticipated within one year only. According to the banks, the average maturity of hedging instruments is around six months.

As for the instrument type, *forwards* are the most popular among exporters after the crisis. Somewhat in contrast to the questionnaire results, according to the banks the share of forwards was almost the same as the share of options and option structures before the crisis. Generally, *options* are more popular among bigger institutional clients. Option structures dominate option business as exporters are reluctant to pay option premiums. Therefore, zero-cost structures are the most popular. Banks estimate that of the exporters who buy either options or option structures, only up to 5% buy the simple option and pay the premium.

Option structures are closely linked to *leverage.* In the past, banks allowed their clients to have a higher level of leverage in their derivatives compared to the present levels, although it has never been very high. Also, clients' attitude to leverage has changed after the crisis. Most of the banks interviewed allow a maximum leverage of 1:1.5[19] nowadays. Leverage was present in about 80–90% of exporters' derivatives before the crisis; now their share is estimated to be around 50%. In

[18] Since the interview was strictly about exporters and their operations, the findings are not necessarily relevant to all clients.

[19] For example, two options in a zero-cost structure with face amounts of EUR 500,000 and EUR 750,000.

addition to leverage, exotic option barriers are used to make an option strategy more attractive than a simple forward. Typically, knock-in type barriers are used, as the use of the knock-out type in hedging strategies is problematic.

Nowadays, banks request *collateral against exporters' derivatives positions* more often than before the crisis, although it is still used only rarely. It is applied on a very individual basis where a client has a high risk profile or a transaction has a risky origin. This way, banks try to avoid large losses if clients default on their trades. Only rare collateralization means that exporters do not need to deliver any other capital after a purchase of a certain financial derivative. For example, in the case of a significant weakening of the domestic currency (as witnessed at the beginning of 2009) exporters would not be called for additional money because of the drop in the market value of their derivative portfolio.

According to the banks, the majority of *exporters prefer active hedging.* Around 50–70% of them try to find more attractive FX levels to start hedging their exposure. Clients tend to panic when the koruna is strengthening, but on the other hand they often shift the entry level to weaker values when the FX rate is depreciating. In the course of time, clients are seen to be becoming more responsible and, after the crisis, even more conservative. Banks admit that "panic selling" is less present and clients are more successful in finding local peaks of the FX rate nowadays. On the other hand, they often lack self-discipline and do not keep to their previously chosen levels, such as target and stop-loss levels. Therefore, they are sometimes a step behind the FX market.

The banks also mentioned one way of hedging where clients hedge their so-called "calculation FX rate". This is used for valuation of their exports in the local currency and is usually set firmer than current FX levels. Some "speculating" clients thus wait for a weaker FX rate, although only until their market rate gets close to their calculation FX rate. At this moment they are forced to hedge to be at least at their calculation FX rate. Some clients are able to gain an extra profit on FX rate volatility on top of their core business, although this should not be the motivation to hedge.

When it comes to the *timing of hedging,* the question of consultation is also important. Banks cannot advise their clients directly on whether current FX levels are suitable for hedging or not without signing a special agreement.[20] Banks do not provide such a service to exporters. Instead, they focus on providing an in-depth description of financial derivatives and their strengths and weaknesses, but the final decision is always up to the client. From time to time, banks also submit investment recommendations with a legal disclaimer. The only agreement signed with clients is a general agreement on derivatives trading, which is usually based on the EMA.[21]

Finally, the banks were interviewed about the estimated *volume of derivatives that exporters use for hedging purposes*. Banks mentioned that the volume plunged at the outbreak of the crisis together with the decline in the export volume. On the other hand, the return towards previous volumes is much slower than the increase in foreign trade turnover. The minimum nominal value of a forward that can be dealt with a client is usually around EUR 10,000, while the minimum

[20] One of the main goals of the 2004 European directive known as MiFID (Markets in Financial Instruments Directive) is consumer protection in investment services. MiFID regulates the relationship between bank and client in such areas as investment consultancy.

[21] The Master Agreement for Financial Transactions prepared by the Czech Banking Association in accordance with European Banking Federation documentation.

option face value is usually EUR 50,000. These amounts should, however, be taken with caution, as many banks do not apply a strict minimum limit (the conditions also depend on the client relationship, current market conditions, etc.).

8. Comparison of the Questionnaire and the Interview Results

To a large extent the banks confirmed the questionnaire findings and also provided additional information about exporters' hedging behaviour. The only significant discrepancy is in the choice of derivatives. While exporters claim to use forwards and natural hedging as primary tools and their reported share of options is very small, banks see the share of forwards and options as being more balanced. Banks also see quite a big rise in forwards after the crisis, while according to the survey questionnaire exporters changed the shares of individual instruments only marginally.

The reasons behind these differences are not clear. A prominent hypothesis is that exporters do not distinguish between outright forward and zero-cost option structures, as such an option strategy is in fact a synthetic forward. When discussing with exporters, we noticed that they often recognize the general features of financial derivatives but do not know their exact names. Therefore, it is possible that some exporters consider zero-cost as a forward and only a simple option purchase as an option.

We also see similar results in the share of *active hedgers*. Banks confirmed that 50–70% of exporters are active hedgers, i.e. they try to find attractive CZK FX rate levels for their hedging.

9. Determinants of Hedging Decisions and Profitability of Hedging

In the first part of this section, we exploit firm-level data to identify the factors influencing the decision to hedge on financial markets. For estimation purposes, we match the questionnaire data with the annual firm-level data reported to the Czech Statistical Office. Thus, besides the questionnaire data described in previous sections, we use two firm-level variables constructed using the Czech Statistical Office database: the group sales ratio and the percentage of foreign capital.[22]

Empirical research modelling the hedging behaviour of firms is scarce. The available literature identifies firm size, sector, export intensity, the geographic dispersion of the countries in which the firm operates and liquidity to be relevant factors in firms' hedging decisions (Allayannis et al., 2001; Fabling and Grimes, 2008b; Davies et al., 2006). Closest to our model specifications, Allayannis et al. (2001) use the financial hedge dummy as the dependent variable. To test whether financial and operational hedging are substitutes or complements, their set of explanatory variables includes the ratio of domestic to foreign sales as well as a geographic dispersion proxy, the number of countries and the number of regions in which firms operate.

[22] As yearly firm-level data are available with significant time lag, we use the 2007 database.

Our model specifications are shown in Table 9-1. The dependent variable is a dummy indicating whether or not a firm hedges using financial instruments (i.e. forwards, swaps or options). Three specifications are considered and estimated. In specification (a), the decision to hedge is supposed to be explained by the size of the firm (proxied by the logarithm of sales), the ratio of exports to sales and the ratio of exports to imports. The inclusion of size is motivated by the expectation that bigger exporters are more likely to hedge on the financial markets compared to smaller ones, for example because of the existence of minimum thresholds for hedging instruments. The relationship between firm size and hedging on financial markets can be clearly seen, for example, in Figure B-1 in Appendix B, which shows the firm size distribution for hedgers and non-hedgers. With a higher ratio of exports to sales, the firm's overall financial situation is expected to be more sensitive to exchange rate changes and such firm to be more motivated to hedge. The ratio of exports to imports is supposed to be a possible proxy for natural hedging.

As the estimated coefficients show, firm size and the ratio of exports to sales are both statistically significant and economically substantial determinants of the decision to hedge on financial markets. On the other hand, the ratio of exports to imports does not help to explain the decision to hedge at all.

In specification (b), the percentage of foreign capital and the group sales ratio are included to reflect the possibly lower need to hedge if the firm has a foreign owner or operates within a multinational group. In line with intuition, the coefficients are negative and in almost all specifications and periods significant.

Table 9-1: Determinants of Hedging Using Financial Instruments (probit type estimation; dependent variable is dummy indicating whether or not firm hedges on financial markets)

	(a)		(b)		(c)	
	pre-crisis years	crisis year	pre-crisis years	crisis year	pre-crisis years	crisis year
Sales (in logarithm)	0,19 ***	0,15 **	0,30 **	0,35 **	0,37 **	0,41 ***
	(0,06)	(0,06)	(0,13)	(0,14)	(0,15)	(0,14)
Export/Sales	1,21 **	1,25 **	2,33 **	2,74 **	2,56 **	2,76 **
	(0,54)	(0,54)	(1,09)	(1,07)	(1,16)	(1,13)
Export/Import	0,00	0,00	0,03	0,01	0,02	0,01
	(0,00)	(0,00)	(0,02)	(0,01)	(0,02)	(0,02)
Percentage of foreign capital			-0,01	-0,02 *	-0,02 *	-0,03 **
			(0,01)	(0,01)	(0,01)	(0,01)
Group sales ratio			-0,77 *	-1,12 **	-0,82 *	-1,17 **
			(0,44)	(0,49)	(0,44)	(0,50)
Constant	-3,57 ***	-3,13 ***	-4,76 **	-4,94 **	-0,01 *	-0,01 *
	(0,99)	(0,96)	(2,42)	(2,29)	(0,01)	(0,01)
Share of exports hedged naturally					-4,95 *	-4,52 *
					(2,56)	(2,35)
Pseudo R-squared	0,07	0,06	0,17	0,22	0,21	0,27
Number of observations	145	146	70	71	70	71

Note: * p<0.10, ** p<0.05, *** p<0.01, standard errors in parentheses.

Finally, in specification (c), the share of exports hedged naturally as reported by firms is added to the determinants. The fact that the coefficient is statistically significant shows that, in line with intuition, natural hedging decreases the need for hedging on financial markets.

Probit estimation is used in all the specifications, as the dependent variable is binary.[23] The number of observations varies for two reasons. First, some firms answered the questions for only one of the two time periods. Second, once the variables constructed using the CZSO database are included, the number of usable observations drops substantially.

In the second estimation, we aim to identify the determinants of the profitability of hedging or non-hedging. As Table 9-2 shows, the use of financial instruments to hedge exports is significantly profitable compared to not hedging, whether estimated without control variables

[23] Besides the probit specification, a two-stage setup was estimated. The decision to hedge on financial markets was modelled in the first stage, while the ratio of exports hedged on financial markets was modelled in the second stage. However, none of the coefficients in the second stage turned out to be significant (the estimation is not shown here).

(specifications (a) and (b)) or with them (specifications (c) and (d)). Comparing the pre-crisis period and the crisis year 2009, which was characterized by reversal of the long-term appreciation trend, one can see that the positive effect of hedging using financial instruments decreased in 2009 but remained positive and significant. Besides hedging using financial instruments, natural hedging and operational hedging turn out to be profitable in specifications (a) and (b). Again, probit estimation is a natural choice here, as the dependent variable is binary. The number of observations varies for the same reasons as in the previous estimations.

Table 9-2: Determinants of Profitability of Hedging or Non-Hedging (dependent variable is dummy indicating whether firm profited from more favourable exchange rate as a result of its decision to hedge or not to hedge)

	Specification			
	(a) pre-crisis years	(b) crisis year	(c) pre-crisis years	(d) crisis year
Ratio of exports hedged naturally or operationally	0,005 *	0,008 **	-0,006	0,000
	(0,003)	(0,003)	(0,006)	(0,005)
Ratio of exports hedged using financial instruments	0,014 ***	0,007 **	0,017 **	0,010 *
	(0,003)	(0,003)	(0,008)	(0,006)
Ratio of exports hedged by taking loan	0,026	0,007	0,085	0,065
	(0,021)	(0,012)	(0,056)	(0,065)
Ratio of export hedged by surcharge	0,003	0,002	-0,071	-0,176
	(0,007)	(0,009)	(0,133)	(0,207)
Sales (in logarithm)			-0,182	-0,260 *
			(0,134)	(0,137)
Export/Sales			-0,339	-0,924
			(0,898)	(0,935)
Export/Import			-0,010	-0,005
			(0,023)	(0,015)
Percentage of foreign capital			-0,015	0,011
			(0,014)	(0,012)
Group sales ratio			-0,101	-0,063
			(0,428)	(0,430)
Constant	-0,444 ***	-0,684 ***	4,115 *	2,726
	(0,138)	(0,143)	(2,446)	(2,136)
Pseudo R-squared	0,10	0,05	0,17	0,11
Number of observations	181	181	70	71

Note: * p<0.10, ** p<0.05, *** p<0.01, estimated using probit estimation, standard errors in parentheses.

Finally, we look at the relationship between the maturity and type of financial market hedging instrument. The cross-tabulation in Table 9-3 shows that while forwards and options are associated primarily with maturities of three months to one year, swaps are typically chosen for hedging over shorter horizons. Nevertheless, forwards are the most popular choice for every maturity.

Table 9-3: Maturity and Instruments

		Forward	Swap	Option
Maturity	7 days – 3 months	18	4	2
	3 months – 1 year	31	2	9
	more than 1 year	11	0	4

10. Conclusions

In this paper, we analyse the hedging behaviour of Czech exporting firms using information from a questionnaire and interviews. Approximately 60% of the firms surveyed hedge their FX exposures, and about 88% of their exports are hedged.[24] Most exporters use natural hedging, i.e. they balance incoming and outgoing payments in foreign currency as well as foreign currency assets and liabilities. Hedgers on financial markets prefer forwards and zero-cost option structures, as they are reluctant to pay option premiums. The most frequent maturity of financial instruments is three months to one year. More than one half of exporters hedge consistently, while around 60% hedge actively, taking advantage of currency moves. Given the losses some exporters suffered during the crisis in 2009, it might be surprising that only a few are considering changing their hedging strategy after the crisis.[25] On the other hand, banks suggest that exporters now prefer simpler hedging instruments and strategies. Our simple model of hedging behaviour suggests that firm size and export-to-sales ratio increase the probability of hedging on financial markets, while trading within a group, being owned by a foreign owner or being hedged naturally reduces the need for financial hedging.

From the macroeconomic point of view, the high share of hedged exports in combination with the typical maturity of hedging instruments of between three months and one year has two consequences. First, exchange rate movements should influence aggregate exports and production with a substantial time lag. Second, short-lived exchange rate fluctuations do not have to influence aggregate exports and production, even if their magnitude is large. This, however, does not mean that such fluctuations do not have substantial impacts on individual firms. In particular, smaller exporters and firms with lower export intensity are less likely to hedge and are therefore more vulnerable to exchange rate shocks.

[24] When we adjust the weights to reflect the firm size distribution in our initial sample of 2,330 companies, the adjusted average rate of hedging decreases to 85%.

[25] According to the questionnaire, 93% of exporters whose hedging or non-hedging had a negative impact on their economic results in both time periods stated that they plan no change in their behaviour.

References

ALLAYANNIS, G., J. IHRIG, AND J. P. WESTON (2001): "Exchange-Rate Hedging: Financial versus Operational Strategies." *American Economic Review*, American Economic Association, Vol. 91(2), pages 391–395, May.

BABECKY, J., K. DYBCZAK, AND K., GALUSCAK (2008): "Survey on Wage and Price Formation of Czech Firms." Working Papers 2008/12, Research Department, Czech National Bank.

BARTRAM, S. M., G. W. BROWN, AND F. R. FEHLE (2003): "International Evidence on Financial Derivatives Usage." Finance 0307003, EconWPA.

BODNAR, G. M., J. GRAHAM, C. R. HARVEY, AND R. C. MARSTON (2011): "Managing Risk Management." AFA 2012 Chicago Meetings Paper.

ČADEK, V. (2008): "Functional Strategy of the Currency Risk Management." Dissertation in Management Studies, Nottingham Trent University, BIBS.

CZECH STATISTICAL OFFICE. [cit. 10-20-10], accessible from www: <http://apl.czso.cz/pll/stazo/STAZO.STAZO?jazyk=EN&prvni_pristup=>

DAVIES, D., C. ECKBERG, AND A. MARSHALL (2006): "The Determinants of Norwegian Exporters' Foreign Exchange Risk Management." *The European Journal of Finance.* 1466–4364, Vol. 12(3), pages 217–240.

DE CEUSTER, M. J. K., E. LAVEREN, AND J. LODEWYCKX (2000): "A Survey into the Use of Derivatives by Large Non-Financial Firms Operating in Belgium." *European Financial Management.* Vol. 6(3).

DÖHRING, B. (2008): "Hedging and Invoicing Strategies to Reduce Exchange Rate Exposure: A Euro-Area Perspective." European Commission, Economic Papers 299, January 2008.

FABLING, R., A.GRIMES (2008A): "Do Exporters Cut the Hedge? Who Hedges and Why." Ministry of Economic Development Occasional Paper 08/02.

FABLING, R., A. GRIMES (2008B): "Over the Hedge? Exporters' Optimal and Selective Hedging Choices." Reserve Bank of New Zealand Discussion Paper Series DP2008/14, Reserve Bank of New Zealand.

FENDEL, R., M. FRENKEL, AND C. SWONKE (2008): "Local Currency Pricing versus Producer Currency Pricing: Direct Evidence from German Exporters." *German Economic Revie.*, Blackwell Publishing, Vol. 9, pages 160–179, 05.

FRIBERG, R., F. WILANDER (2008): "The Currency Denomination of Exports – A Questionnaire Study." *Journal of International Economics.* Elsevier, Vol. 75(1), pages 54–69, May.

HAGELIN, N., B. PRAMBORG (2004):. "Hedging Foreign Exchange Exposure: Risk Reduction from Transaction and Translation Hedging." *Journal of International Financial Management & Accounting.* Vol. 15, pages 1–20.

ROTTOVÁ, H., L. RŮŽIČKA, M. ŘÍKOVSKÝ, AND R. ŠNOBL (2008): "Survey of Price-setting Practices in Private Firms." (Průzkum chování podnikové sféry v oblasti cenové tvorby), mimeo in Czech.

Appendix A

Questionnaire sent to survey participants:

1. What were your earnings, exports and imports volumes?

2005–2008 (approx. average per year in CZK thousands)	**2009 (in CZK thousands)**
Total earnings……	*Total earnings……*
Total exports……..	*Total exports……..*
Total imports……	*Total imports ……*

2. Where are your main trading partners located? (more than one answer possible)
   - *a) Eurozone (incl. Slovakia.) - around……% of exports*
   - *b) Others in Europe - around……% of exports*
   - *c) America - around……% of exports*
   - *d) Africa - around……% of exports*
   - *e) Asia, Australia - around……% of exports*

3. In what currency do you receive payments for your exports? (more than one answer possible)
   - *a) EUR - around……% of exports*
   - *b) USD - around……% of exports*
   - *c) CZK - around……% of exports*
   - *d) GBP - around……% of exports*
   - *e) Others - around……% of exports*

4. Approximately what proportion of your exports is usually hedged against FX risk? (please fill in all possible answers for both periods of time)

2005–2008	**2009**
a)…….. % of committed trades	*a)…….. % of committed trades*
b)……..% of anticipated trades within one year	*b)……..% of anticipated trades within one year*
c)……..% of anticipated trades in subsequent years	*c)……..% of anticipated trades in subsequent years*

5. What instruments do you use to hedge against currency risk in % of exports? (more than one answer possible)

2005–2008

- *a) natural hedging*
- *b) operational hedging*
- *c) foreign-denominated debt*
- *d) outright forward*
- *e) FX swap*
- *f) option and option structures*
- *g surcharges covering possible FX losses*
- *h) no hedging at all*

2009

- *a) natural hedging*
- *b) operational hedging*
- *c) foreign-denominated debt*
- *d) outright forward*
- *e) FX swap*
- *f) option and option structures*
- *g) surcharges covering possible FX losses*
- *h) no hedging at all*

6. What is the typical maturity of dealt derivatives (forwards, swaps, options)? (only one answer for each period of time)

2005–2008

- □ *a) shorter than 7 days* *around……% of exports*
- □ *b) 7 days – 3 months (incl.)* *around……% of exports*
- □ *c) 3 months – 1 year (incl.)* *around……% of exports*
- □ *d) longer than 1 year* *around……% of exports*

2009

- □ *a) shorter than 7 days* *around……% of exports*
- □ *b) 7 days – 3 months (incl.)* *around……% of exports*
- □ *c) 3 months – 1 year (incl.)* *around……% of exports*
- □ *d) longer than 1 year* *around……% of exports*

7. If your firm hedges against FX risk, does it hedge

- □ *a) consistently*
- □ *b) seasonally*
- □ *c) if the current CZK FX rate is strong by historical comparison*
- □ *d) if the current CZK FX rate is weak by historical comparison*
- □ *e) if according to a forecast the koruna is expected to firm*
- □ *f) in a different way (please say how)*

8. How was your P&L affected by hedging/no hedging? Do you think that in the given period of time:

2005–2008

- □ *a) due to hedging against FX risk you had a better FX rate on average (including hedging costs) than if you had not hedged;*
- □ *b) due to hedging against FX risk you had a worse FX rate on average (including hedging costs) than if you had not hedged;*
- □ *c) due to hedging against FX risk you had around the same FX rate on average (including hedging costs) than if you had not hedged;*
- □ *d) due to not hedging against FX risk you had FX gains;*
- □ *e) due to not hedging against FX risk you had FX losses;*
- □ *f) due to not hedging against FX risk you had neither FX gains nor FX losses.*

2009

- □ *a) due to hedging against FX risk you had a better FX rate on average (including hedging costs) than if you had not hedged;*
- □ *b) due to hedging against FX risk you had a worse FX rate on average (including hedging costs) than if you had not hedged;*
- □ *c) due to hedging against FX risk you had around the same FX rate on average (including hedging costs) than if you had not hedged;*
- □ *d) due to not hedging against FX risk you had FX gains;*
- □ *e) due to not hedging against FX risk you had FX losses;*
- □ *f) due to not hedging against FX risk you had neither FX gains nor FX losses.*

9. On what FX rate forecasts is your hedging decision based?

- □ *a) Consensus forecast*
- □ *b) Banks*
- □ *c) Home-made*
- □ *d) External advisor*
- □ *e) Media*
- □ *f) Others*

10. Do you expect (or plan) any change in your hedging behaviour due to the recent crisis? (more than one answer possible)

- *a) no change*
- *b) we will start/are starting to hedge committed trades only*
- *c) we will start/are starting to use different instruments*
- *d) we will reduce/are reducing hedging (in % of exports)*
- *e) we will stop hedging totally*

Explanatory notes to the questionnaire

1. The Eurozone comprises 16 countries (including Slovakia, which joined on 1 January 2009): Belgium, Finland, France, Ireland, Italy, Cyprus, Luxembourg, Malta, Germany, the Netherlands, Portugal, Austria, Greece, Slovakia, Slovenia and Spain.

2. For our research the currency in which the payment is made is all that matters. We do not monitor what currency is stated in the invoice or what currency is stated in the contract.

3. FX risk = the risk of loss due to a change in the FX rate of the foreign currency in which a contract is settled.

4. Natural hedging = the balancing of foreign currency payments so that, for example, EUR gained from exports are used for purchasing production inputs in EUR without exchanging foreign currencies. Assets in foreign currency are covered by liabilities in the same currency.

5. Operational hedging involves, for example, the moving of a company's production to the customer's country. The exporter thus receives local currency for its goods and also has the majority of its cost (wages, materials, etc.) in local currency.

6. An outright forward is a financial derivative involving a modified spot operation that is settled at some point in the future, unlike in the case of spot transactions. It is an agreement, made today, to buy something in the future for a fixed price.

7. An FX swap involves the actual exchange of two currencies (the principal amount only) on a specific date at a rate agreed at the time of the conclusion of the contract, and a reverse exchange of the same two currencies at a date further in the future and at a rate agreed at the time of the contract.

8. Consensus Forecast is regular publication issued by Consensus Economics, a company specializing in macroeconomic forecasts.

9. Some media organizations publish surveys of economists' FX rate forecasts or forecasts made by national or supranational institutions.

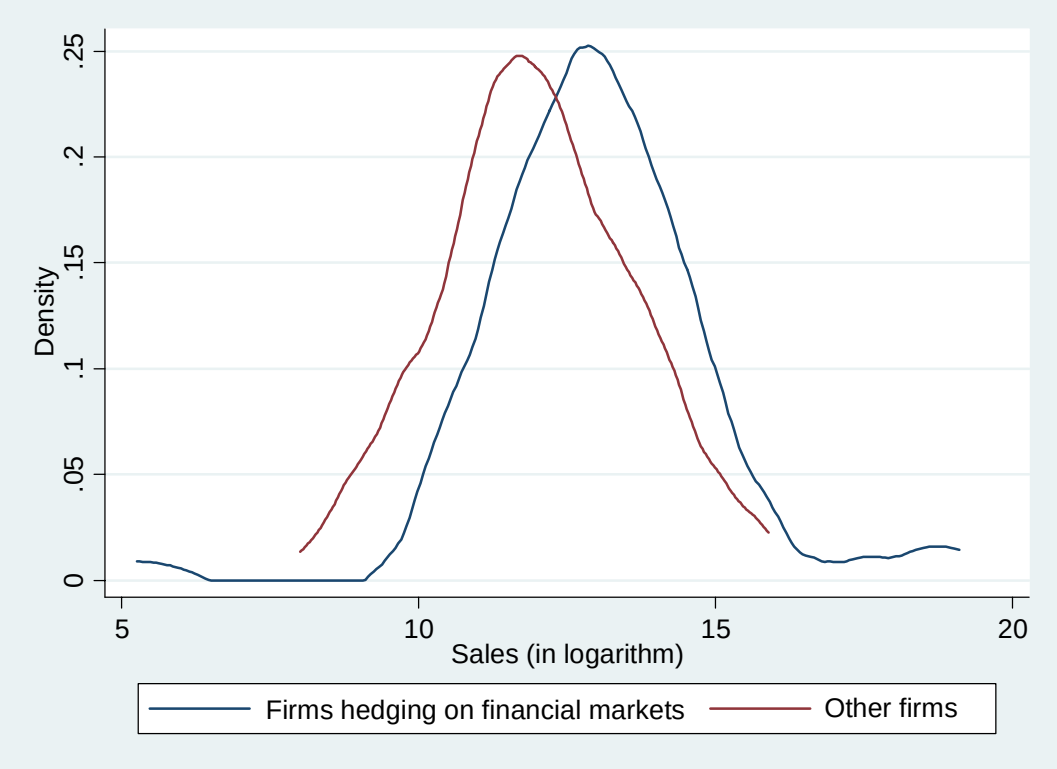
10. Consistently means gradually, with deals being made without consideration of actual or expected FX rate developments.

Appendix B

Table B-1: Summary Statistics

		Number of observations	Mean	Std. Dev.	Min	Max
Hedging on financial markets dummy	2005–2008	181	0.39	0.49	0.00	1.00
	2009	181	0.35	0.48	0.00	1.00
Sales (in logarithm)	2005–2008	181	12.39	1.80	5.26	19.11
	2009	176	12.27	1.88	5.27	19.05
Exports/Sales	2005–2008	179	0.77	0.21	0.00	1.09
	2009	173	0.76	0.23	0.00	1.00
Exports/Imports	2005–2008	145	14.01	49.29	0.00	475.83
	2009	146	18.93	68.81	0.09	644.58
Percentage of foreign capital		111	93.95	15.65	29.00	100.00
Group sales ratio		119	0.40	0.43	0.00	1.00

Figure B-1: Firm Size Distribution for Hedgers and Non-Hedgers



CNB WORKING PAPER SERIES

14/2011	Vlastimil Čadek Helena Rottová Branislav Saxa	*Hedging behaviour of Czech exporting firms*
13/2011	Michal Franta Roman Horváth Marek Rusnák	*Evaluating changes in the monetary transmission mechanism in the Czech Republic*
12/2011	Jakub Ryšánek Jaromír Tonner Osvald Vašíček	*Monetary policy implications of financial frictions in the Czech Republic*
11/2011	Zlatuše Komárková Adam Geršl Luboš Komárek	*Models for stress testing Czech banks´ liquidity risk*
10/2011	Michal Franta Jozef Baruník Roman Horváth Kateřina Šmídková	*Are Bayesian fan charts useful for central banks? Uncertainty, forecasting, and financial stability stress tests*
9/2011	Kamil Galuščák Lubomír Lízal	*The impact of capital measurement error correction on firm-level production function estimation*
8/2011	Jan Babecký Tomáš Havránek Jakub Matějů Marek Rusnák Kateřina Šmídková Bořek Vašíček	*Early warning indicators of economic crises: Evidence from a panel of 40 developed countries*
7/2011	Tomáš Havránek Zuzana Iršová	*Determinants of horizontal spillovers from FDI: Evidence from a large meta-analysis*
6/2011	Roman Horváth Jakub Matějů	*How are inflation targets set?*
5/2011	Bořek Vašíček	*Is monetary policy in the new EU member states asymmetric?*
4/2011	Alexis Derviz	*Financial frictions, bubbles, and macroprudential policies*
3/2011	Jaromír Baxa Roman Horváth Bořek Vašíček	*Time-varying monetary-policy rules and financial stress: Does financial instability matter for monetary policy?*
2/2011	Marek Rusnák Tomáš Havránek Roman Horváth	*How to solve the price puzzle? A meta-analysis*
1/2011	Jan Babecký Aleš Bulíř Kateřina Šmídková	*Sustainable real exchange rates in the new EU member states: What did the Great Recession change?*
15/2010	Ke Pang Pierre L. Siklos	*Financial frictions and credit spreads*
14/2010	Filip Novotný Marie Raková	*Assessment of consensus forecasts accuracy: The Czech National Bank perspective*
13/2010	Jan Filáček Branislav Saxa	*Central bank forecasts as a coordination device*
12/2010	Kateřina Arnoštová David Havrlant Luboš Růžička	*Short-term forecasting of Czech quarterly GDP using monthly indicators*

	Peter Tóth	
11/2010	Roman Horváth Kateřina Šmídková Jan Zápal	*Central banks´ voting records and future policy*
10/2010	Alena Bičáková Zuzana Prelcová Renata Pašaličová	*Who borrows and who may not repay?*
9/2010	Luboš Komárek Jan Babecký Zlatuše Komárková	*Financial integration at times of financial instability*
8/2010	Kamil Dybczak Peter Tóth David Voňka	*Effects of price shocks to consumer demand. Estimating the QUAIDS demand system on Czech Household Budget Survey data*
7/2010	Jan Babecký Philip Du Caju Theodora Kosma Martina Lawless Julián Messina Tairi Rõõm	*The margins of labour cost adjustment: Survey evidence from European Firms*
6/2010	Tomáš Havránek Roman Horváth Jakub Matějů	*Do financial variables help predict macroeconomic environment? The case of the Czech Republic*
5/2010	Roman Horváth Luboš Komárek Filip Rozsypal	*Does money help predict inflation? An empirical assessment for Central Europe*
4/2010	Oxana Babecká Kucharčuková Jan Babecký Martin Raiser	*A Gravity approach to modelling international trade in South-Eastern Europe and the Commonwealth of Independent States: The role of geography, policy and institutions*
3/2010	Tomáš Havránek Zuzana Iršová	*Which foreigners are worth wooing? A Meta-analysis of vertical spillovers from FDI*
2/2010	Jaromír Baxa Roman Horváth Bořek Vašíček	*How does monetary policy change? Evidence on inflation targeting countries*
1/2010	Adam Geršl Petr Jakubík	*Relationship lending in the Czech Republic*
15/2009	David N. DeJong Roman Liesenfeld Guilherme V. Moura Jean-Francois Richard Hariharan Dharmarajan	*Efficient likelihood evaluation of state-space representations*
14/2009	Charles W. Calomiris	*Banking crises and the rules of the game*
13/2009	Jakub Seidler Petr Jakubík	*The Merton approach to estimating loss given default: Application to the Czech Republic*
12/2009	Michal Hlaváček Luboš Komárek	*Housing price bubbles and their determinants in the Czech Republic and its regions*
11/2009	Kamil Dybczak Kamil Galuščák	*Changes in the Czech wage structure: Does immigration matter?*
10/2009	Jiří Böhm Petr Král	*Percepion is always right: The CNB´s monetary policy in the media*

	Branislav Saxa	
9/2009	Alexis Derviz Marie Raková	*Funding costs and loan pricing by multinational bank affiliates*
8/2009	Roman Horváth Anca Maria Podpiera	*Heterogeneity in bank pricing policies: The Czech evidence*
7/2009	David Kocourek Filip Pertold	*The impact of early retirement incentives on labour market participation: Evidence from a parametric change in the Czech Republic*
6/2009	Nauro F. Campos Roman Horváth	*Reform redux: Measurement, determinants and reversals*
5/2009	Kamil Galuščák Mary Keeney Daphne Nicolitsas Frank Smets Pawel Strzelecki Matija Vodopivec	*The determination of wages of newly hired employees: Survey evidence on internal versus external factors*
4/2009	Jan Babecký Philip Du Caju Theodora Kosma Martina Lawless Julián Messina Tairi Rõõm	*Downward nominal and real wage rigidity: Survey evidence from European firms*
3/2009	Jiri Podpiera Laurent Weill	*Measuring excessive risk-taking in banking*
2/2009	Michal Andrle Tibor Hlédik Ondra Kameník Jan Vlček	*Implementing the new structural model of the Czech National Bank*
1/2009	Kamil Dybczak Jan Babecký	*The impact of population ageing on the Czech economy*
14/2008	Gabriel Fagan Vitor Gaspar	*Macroeconomic adjustment to monetary union*
13/2008	Giuseppe Bertola Anna Lo Prete	*Openness, financial markets, and policies: Cross-country and dynamic patterns*
12/2008	Jan Babecký Kamil Dybczak Kamil Galuščák	*Survey on wage and price formation of Czech firms*
11/2008	Dana Hájková	*The measurement of capital services in the Czech Republic*
10/2008	Michal Franta	*Time aggregation bias in discrete time models of aggregate duration data*
9/2008	Petr Jakubík Christian Schmieder	*Stress testing credit risk: Is the Czech Republic different from Germany?*
8/2008	Sofia Bauducco Aleš Bulíř Martin Čihák	*Monetary policy rules with financial instability*
7/2008	Jan Brůha Jiří Podpiera	*The origins of global imbalances*
6/2008	Jiří Podpiera Marie Raková	*The price effects of an emerging retail market*

5/2008	Kamil Dybczak David Voňka Nico van der Windt	*The effect of oil price shocks on the Czech economy*
4/2008	Magdalena M. Borys Roman Horváth	*The effects of monetary policy in the Czech Republic: An empirical study*
3/2008	Martin Cincibuch Tomáš Holub Jaromír Hurník	*Central bank losses and economic convergence*
2/2008	Jiří Podpiera	*Policy rate decisions and unbiased parameter estimation in conventionally estimated monetary policy rules*
1/2008	Balázs Égert Doubravko Mihaljek	*Determinants of house prices in Central and Eastern Europe*
17/2007	Pedro Portugal	*U.S. unemployment duration: Has long become longer or short become shorter?*
16/2007	Yuliya Rychalovská	*Welfare-based optimal monetary policy in a two-sector small open economy*
15/2007	Juraj Antal František Brázdik	*The effects of anticipated future change in the monetary policy regime*
14/2007	Aleš Bulíř Kateřina Šmídková Viktor Kotlán David Navrátil	*Inflation targeting and communication: Should the public read inflation reports or tea leaves?*
13/2007	Martin Cinncibuch Martina Horníková	*Measuring the financial markets' perception of EMU enlargement: The role of ambiguity aversion*
12/2007	Oxana Babetskaia-Kukharchuk	*Transmission of exchange rate shocks into domestic inflation: The case of the Czech Republic*
11/2007	Jan Filáček	*Why and how to assess inflation target fulfilment*
10/2007	Michal Franta Branislav Saxa Kateřina Šmídková	*Inflation persistence in new EU member states: Is it different than in the Euro area members?*
9/2007	Kamil Galuščák Jan Pavel	*Unemployment and inactivity traps in the Czech Republic: Incentive effects of policies*
8/2007	Adam Geršl Ieva Rubene Tina Zumer	*Foreign direct investment and productivity spillovers: Updated evidence from Central and Eastern Europe*
7/2007	Ian Babetskii Luboš Komárek Zlatuše Komárková	*Financial integration of stock markets among new EU member states and the euro area*
6/2007	Anca Pruteanu-Podpiera Laurent Weill Franziska Schobert	*Market power and efficiency in the Czech banking sector*
5/2007	Jiří Podpiera Laurent Weill	*Bad luck or bad management? Emerging banking market experience*
4/2007	Roman Horváth	*The time-varying policy neutral rate in real time: A predictor for future inflation?*
3/2007	Jan Brůha Jiří Podpiera Stanislav Polák	*The convergence of a transition economy: The case of the Czech Republic*

2/2007	Ian Babetskii Nauro F. Campos	*Does reform work?* *An econometric examination of the reform-growth puzzle*
1/2007	Ian Babetskii Fabrizio Coricelli Roman Horváth	*Measuring and explaining inflation persistence:* *Disaggregate evidence on the Czech Republic*
13/2006	Frederic S. Mishkin Klaus Schmidt-Hebbel	*Does inflation targeting make a difference?*
12/2006	Richard Disney Sarah Bridges John Gathergood	*Housing wealth and household indebtedness: Is there a household 'financial accelerator'?*
11/2006	Michel Juillard Ondřej Kameník Michael Kumhof Douglas Laxton	*Measures of potential output from an estimated DSGE model of the United States*
10/2006	Jiří Podpiera Marie Raková	*Degree of competition and export-production relative prices when the exchange rate changes: Evidence from a panel of Czech exporting companies*
9/2006	Alexis Derviz Jiří Podpiera	*Cross-border lending contagion in multinational banks*
8/2006	Aleš Bulíř Jaromír Hurník	*The Maastricht inflation criterion: "Saints" and "Sinners"*
7/2006	Alena Bičáková Jiří Slačálek Michal Slavík	*Fiscal implications of personal tax adjustments in the Czech Republic*
6/2006	Martin Fukač Adrian Pagan	*Issues in adopting DSGE models for use in the policy process*
5/2006	Martin Fukač	*New Keynesian model dynamics under heterogeneous expectations and adaptive learning*
4/2006	Kamil Dybczak Vladislav Flek Dana Hájková Jaromír Hurník	*Supply-side performance and structure in the Czech Republic (1995–2005)*
3/2006	Aleš Krejdl	*Fiscal sustainability – definition, indicators and assessment of Czech public finance sustainability*
2/2006	Kamil Dybczak	*Generational accounts in the Czech Republic*
1/2006	Ian Babetskii	*Aggregate wage flexibility in selected new EU member states*
14/2005	Stephen G. Cecchetti	*The brave new world of central banking: The policy challenges posed by asset price booms and busts*
13/2005	Robert F. Engle Jose Gonzalo Rangel	*The spline GARCH model for unconditional volatility and its global macroeconomic causes*
12/2005	Jaromír Beneš Tibor Hlédik Michael Kumhof David Vávra	*An economy in transition and DSGE: What the Czech national bank's new projection model needs*
11/2005	Marek Hlaváček Michael Koňák Josef Čada	*The application of structured feedforward neural networks to the modelling of daily series of currency in circulation*

10/2005	Ondřej Kameník	*Solving SDGE models: A new algorithm for the sylvester equation*
9/2005	Roman Šustek	*Plant-level nonconvexities and the monetary transmission mechanism*
8/2005	Roman Horváth	*Exchange rate variability, pressures and optimum currency area criteria: Implications for the central and eastern european countries*
7/2005	Balázs Égert Luboš Komárek	*Foreign exchange interventions and interest rate policy in the Czech Republic: Hand in glove?*
6/2005	Anca Podpiera Jiří Podpiera	*Deteriorating cost efficiency in commercial banks signals an increasing risk of failure*
5/2005	Luboš Komárek Martin Melecký	*The behavioural equilibrium exchange rate of the Czech koruna*
4/2005	Kateřina Arnoštová Jaromír Hurník	*The monetary transmission mechanism in the Czech Republic (evidence from VAR analysis)*
3/2005	Vladimír Benáček Jiří Podpiera Ladislav Prokop	*Determining factors of Czech foreign trade: A cross-section time series perspective*
2/2005	Kamil Galuščák Daniel Münich	*Structural and cyclical unemployment: What can we derive from the matching function?*
1/2005	Ivan Babouček Martin Jančar	*Effects of macroeconomic shocks to the quality of the aggregate loan portfolio*
10/2004	Aleš Bulíř Kateřina Šmídková	*Exchange rates in the new EU accession countries: What have we learned from the forerunners*
9/2004	Martin Cincibuch Jiří Podpiera	*Beyond Balassa-Samuelson: Real appreciation in tradables in transition countries*
8/2004	Jaromír Beneš David Vávra	*Eigenvalue decomposition of time series with application to the Czech business cycle*
7/2004	Vladislav Flek, ed.	*Anatomy of the Czech labour market: From over-employment to under-employment in ten years?*
6/2004	Narcisa Kadlčáková Joerg Keplinger	*Credit risk and bank lending in the Czech Republic*
5/2004	Petr Král	*Identification and measurement of relationships concerning inflow of FDI: The case of the Czech Republic*
4/2004	Jiří Podpiera	*Consumers, consumer prices and the Czech business cycle identification*
3/2004	Anca Pruteanu	*The role of banks in the Czech monetary policy transmission mechanism*
2/2004	Ian Babetskii	*EU enlargement and endogeneity of some OCA criteria: Evidence from the CEECs*
1/2004	Alexis Derviz Jiří Podpiera	*Predicting bank CAMELS and S&P ratings: The case of the Czech Republic*

CNB RESEARCH AND POLICY NOTES

3/2011	František Brázdik Michal Hlaváček Aleš Maršál	*Survey of research on financial sector modeling within DSGE models: What central banks can learn from it*
2/2011	Adam Geršl Jakub Seidler	*Credit growth and capital buffers: Empirical evidence from Central and Eastern European countries*
1/2011	Jiří Böhm Jan Filáček Ivana Kubicová Romana Zamazalová	*Price-level targeting – A real alternative to inflation targeting?*
1/2008	Nicos Christodoulakis	*Ten years of EMU: Convergence, divergence and new policy prioritie*
2/2007	Carl E. Walsh	*Inflation targeting and the role of real objectives*
1/2007	Vojtěch Benda Luboš Růžička	*Short-term forecasting methods based on the LEI approach: The case of the Czech Republic*
2/2006	Garry J. Schinasi	*Private finance and public policy*
1/2006	Ondřej Schneider	*The EU budget dispute – A blessing in disguise?*
5/2005	Jan Stráský	*Optimal forward-looking policy rules in the quarterly projection model of the Czech National Bank*
4/2005	Vít Bárta	*Fulfilment of the Maastricht inflation criterion by the Czech Republic: Potential costs and policy options*
3/2005	Helena Sůvová Eva Kozelková David Zeman Jaroslava Bauerová	*Eligibility of external credit assessment institutions*
2/2005	Martin Čihák Jaroslav Heřmánek	*Stress testing the Czech banking system: Where are we? Where are we going?*
1/2005	David Navrátil Viktor Kotlán	*The CNB's policy decisions – Are they priced in by the markets?*
4/2004	Aleš Bulíř	*External and fiscal sustainability of the Czech economy: A quick look through the IMF's night-vision goggles*
3/2004	Martin Čihák	*Designing stress tests for the Czech banking system*
2/2004	Martin Čihák	*Stress testing: A review of key concepts*
1/2004	Tomáš Holub	*Foreign exchange interventions under inflation targeting: The Czech experience*

CNB ECONOMIC RESEARCH BULLETIN

November 2011	*Macro-financial linkages: Theory and applications*
April 2011	*Monetary policy analysis in a central bank*
November 2010	*Wage adjustment in Europe*
May 2010	*Ten years of economic research in the CNB*
November 2009	*Financial and global stability issues*
May 2009	*Evaluation of the fulfilment of the CNB's inflation targets 1998–2007*

December 2008	*Inflation targeting and DSGE models*
April 2008	*Ten years of inflation targeting*
December 2007	*Fiscal policy and its sustainability*
August 2007	*Financial stability in a transforming economy*
November 2006	*ERM II and euro adoption*
August 2006	*Research priorities and central banks*
November 2005	*Financial stability*
May 2005	*Potential output*
October 2004	*Fiscal issues*
May 2004	*Inflation targeting*
December 2003	*Equilibrium exchange rate*

Czech National Bank
Economic Research Department
Na Příkopě 28, 115 03 Praha 1
Czech Republic
phone: +420 2 244 12 321
fax: +420 2 244 14 278
http://www.cnb.cz
e-mail: research@cnb.cz
ISSN 1803-7070